Progress Energy Service Company

Optimized Energy Value Chain

Abstract

Progress Energy Service Company's (Progress Energy) Optimized Energy Value Chain project involves the deployment of advanced metering and distribution automation systems. The project aims at reducing peak loads, overall energy use, and operations and maintenance costs while improving distribution system efficiency, reliability, and power quality. The project implements two-way communications to: (1) allow customers to view their energy consumption through a Web portal, and (2) allow Progress Energy to manage, measure, and verify targeted demand reductions during peak periods. New information and communications systems capture meter data for billing and future implementation of new pricing programs and service offerings. The project includes a distribution management system, automated switching, and integrated voltage and reactive power control to reduce line losses and improve service reliability. The project involves installation of advanced transmission systems including on-line monitoring equipment on key and "at-risk" transmission substations and transformer banks. The project includes installation of up to 600 electric vehicle charging stations in the Carolinas and Florida service territories to encourage use of electric vehicles.

Smart Grid Features

Communications infrastructure includes the advanced metering infrastructure (AMI) communications system, a two-way network that connects the meter to various backhaul points and a high-speed network that connects the substations to a central processing center. The infrastructure is based on industry-open standards to handle the added two-way communication between the new substation devices and the distribution supervisory control and data acquisition system (DSCADA) system. The new network replaces existing remote terminal units and is fully integrated to allow direct communications between the central data processor and substation devices.

Advanced metering infrastructure includes deployment of approximately 160,000 smart meters, which replace Progress Energy's remaining electro-mechanical meters, providing full coverage of its service territory. The project also includes supporting communications infrastructure. This system provides automated meter reading,

At-A-Glance

Recipient: Progress Energy Service Company

State: Florida, North Carolina, and South Carolina

NERC Region: SERC Reliability Corporation and Florida Reliability Coordinating Council

Total Budget: $520,185,889

Federal Share: $200,000,000

Project Type: AMI and Customer Systems
Electric Distribution Systems
Electric Transmission Systems

Equipment

- 160,000 Smart Meters
- AMI Communication Systems
  - Meter Communications Network
  - Backhaul Communications
- Meter Data Management System
- Customer Web Portal Access for 160,000 customers
- Up to 190,000 Direct Load Control Devices
- Distribution Automation Equipment for 2,460 out of 2,460 circuits
  - Distribution Management System
  - SCADA Communications Network
  - Automated Distribution Circuit Switches
  - Automated Capacitors
  - Automated Voltage Regulators
  - Equipment Condition Monitors
- Up to 600 Electric Vehicle Charging Stations

Time-Based Rate Programs for Approximately 2,400 Customers

- Time of Use
- Variable Peak Pricing
- Real Time Pricing

Key Targeted Benefits

- Reduced Costs from Distribution Line Losses and Equipment Failures
- Reduced Electricity Costs for Customers
- Reduced Operating and Maintenance Costs
- Reduced Meter Reading Costs
- Deferred Investment in Generation, Transmission, and Distribution Capacity Expansion
- Improved Electric Service Reliability and Power Quality
- Reduced Ancillary Service Cost
- Reduced Greenhouse Gas and Criteria Pollutant Emissions
- Reduced Truck Fleet Fuel Usage

improved meter accuracy, enhanced outage response and notification, and improved theft of service detection. More detailed and timely data on peak electricity usage improves load forecasting and capital investment planning. Customers can view their energy use through a Web portal established by Progress Energy.

Direct load control devices expand existing direct load control systems in Florida to enable better two-way communications and to maintain and transition existing demand-response capacity. The existing systems are only capable of one-way "paging" communications and the upgrade enables Progress Energy to control the load to receive feedback about effectiveness. This capability gives Progress Energy greater control during peak load periods and thus helps defer transmission and distribution capacity additions.

Time-based rate programs consist of pilot programs in North and South Carolina and Florida. The pilot programs involve new load research meters and systems to enhance the capabilities of existing load research meters. The purpose of the pilots is to evaluate customer segmentation and possible rate design options. Potential time-based pricing schemes include time-of-use rates, flat rates with critical peak pricing, flat rates and variable peak pricing, and real-time pricing based on hourly generation costs.

Distribution automation systems include capabilities to perform real-time state estimation by running load-flow models to understand system operation. These advanced grid modeling capabilities provide tools for more cost-effective integration of customer-owned distributed energy resources. By combining the use of automated switches and reclosers with the distribution management system, outages and restoration times can also be reduced. The switches and reclosers use sensing capabilities to enable the creation of loop-based feeders, offering faster restoration times, which contribute to improved system reliability. Substation upgrades include equipment condition monitoring devices, which alert the utility of any problem with the substation equipment, preventing failures and reducing operations and maintenance costs.

Distribution system energy efficiency improvements involve the deployment of automated capacitor and regulator controls. The automation of these systems allows for greater control of power quality and enables more cost-effective voltage and reactive power control. Increased voltage controls allow for smaller voltage drops over the distribution feeders and improved power factors, reducing line losses and increasing overall efficiency of the system.

Advanced transmission systems include improved monitoring and sensing equipment as part of the condition-based management project, allowing grid operators to better assess the state of the equipped transformers and further optimize maintenance cycles. Additionally, this equipment provides visibility to developing fault conditions and allows for the pre-emption of transformer failures. Savings are realized from reductions in equipment replacements, cleanup costs from transformer failures, and oil consumed by transformer systems. Progress Energy prioritizes equipment installations based on an evaluation of transformers throughout the transmission grid, considering their criticality to the system, condition, age, operational history, and resulting risk profile. The monitoring system consists of a commercially available multi-gas and moisture sensor for the main tank of the transformer, a multi-gas sensor for the tap changer compartment for load tap changing transformers, a bushing monitoring system, and a communication system for collecting the data and integrating it into the Progress Energy enterprise system.

Electric vehicle charging stations are being installed in the Carolinas and Florida in up to 600 locations in the Progress Energy service territory**.** The stations help to encourage early adoption of electric vehicles. The stations also provide Progress Energy with information regarding the charging practices of electric vehicle owners, which can be used to plan for the future increase in the number of electric vehicles on the road.

Timeline

Key Milestones	Target Dates
AMI asset deployment begins	Q3 2012
Distribution automation asset deployment begins	Q4 2009
Distribution automation asset deployment ends	Q4 2012
AMI asset deployment ends	Q2 2013

Contact Information

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